THE TAMIL NUMERALS

Their Shapes and their Revealing Relationship with the Hindu-Arabic Numbers

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By

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HOW the Tamil numbers took their shape, and how they may be related to the shapes of the 'Hindu-Arabic Numerals' will be the main theme of this paper. I also indicate the immense room for proving-or perhaps for further study - that the 'Indian' source for the Hindu Arabic numerals was indeed South India.

The Tamil numbers as found in Thirunelveli inscriptions and as taught to us in our Elementary School days in our District (Ramanathapuram), have a sound basis for their shape. (Fig. 1) Those forms are *NOT* 'arbitrary symbols', or 'mere arbitrary invention' (as mentioned in Everyman's Encyclopaedia-vide Numerals pp. 590—592-New Revised Edition, 1932?) "......NO MERE ARBITRARY SYSTEM CAN EXPLAIN". Lastly the article suggests that "the Hindu system........., though admittedly obscure in origin, is not only clearly of high antiquity, but reveals on enquiry a foundation of still older systems........" My attempt is to explain some aspects of the 'obscure' origin of the Hindu Arabic numerals.

There are volumes of information regarding the numerals in Asoka, Brahmi, Saka, Nagari, Nasik, Gupta, Kusma, Valhabi, Kalinga, Nepal etc. inscriptions. (Fig 2). Comparative studies of these forms with those of the Hindu-Arabic numerals have been made. And, wherever they found no plausible reason for supporting their view that the Hindu-Arabic numerals ,ere derived from some of the above-mentioned insciptions, they found some other 'explanations'. Since many books are available to explain those relationships, and none mentions about Tamil numerals in any detail, I shall

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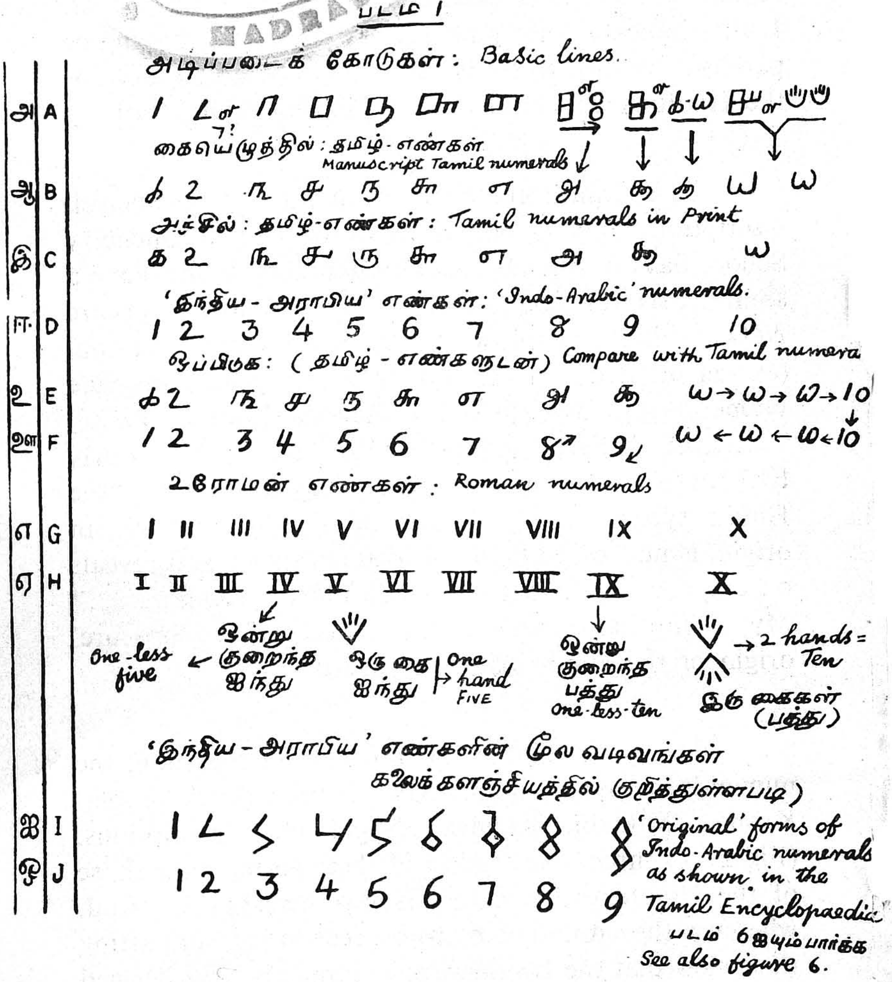

Fig. 1

confine myself to the shape of the Tamil numerals for a comparative study.

One thing is clear : the Tamilians have a rationalized system of writing their numerals following a logical scheme throughout. Please compare the possible evolution of the Tamil numerals from the basic figures as given in Fig. 1 (a, b, c) with those given for the evolution of the Hindu-Arabic numerals as given in the Tamil Encyclopaedia-Fig. 1. i & j.

1, **2**, and **3** can be explained in different ways; and we need not quarrel with the explanation of the way the Arabs might have arrived at those first three figures. Number **4** also has the basic four strokes. But the Hindu-Arabic number **5** has no five strokes; perhaps one may say that the earlier Hindu-Arabic number **5** had five strokes; (the real 'Modern' Arabic **5** is a small o -a small zero!) but look at the way the five lines have been drawn; it has no relation to four represented in one way, and the four strokes in the earlier form of Arbaic five are noted in a different way. Why?.........If 'six' in the 'earlier' form of Arabic numerals has six strokes, here again the four strokes in a diamond form have no relation to the four open lines standing for four; and then two strokes to the 'diamond' are added for giving the figure of six (6); Right, perhaps! But note the earlier Arabic form representing seven: In this the 'diamond' is there; two lines above it are there; but the horizontal line turns about! Why?.........Of course the reason for the seventh line added down below the 'diamond' is understood. But then instead of adding one line to the figure representing six, why has the 'flag' in this turned about?

Obviously to conform to the form of **7** now in vogue! Again just as the five in the earlier Arabic form took a different shape - unrelated to the figure for four - just to conform to the 5 in vogue.........Number **8** in the earlier Arabic form has two 'diamonds'. Let us accept. But, again, this 'diamond' standing for four, while it is very reasonable, is found to be used only from six onwards, and even four in the earlier Arabic writing has **not** been represented on that basis; and, in five too this 'diamond' four is **not** found. Revealingly strange it looks!.........Now comes 'nine' in the earlier Arabic numeral : two 'diamonds' with an additional line below. Well, let us accept that nine **has** nine strokes! And that too very much resembling the modern 9 !...... But one cannot but stop to ask why that additional stroke to the figure for eight should have been marked where it has been, especially when we see the figure for **7** with its 'tail' straight. So, again the obvious doubt arises. Next, for the one who found nine strokes for **9**, it should have been just equally easy to add one more line somewhere to indicate number ten! Why has this **not** been done? For the obvious reason that he could not find ten strokes in the **10** in use!

Please note also the figures in '**1**' and '**0**' in the figure **6**. And compare the so-called 'early' forms of the Arabic numerals and the modern Arabic numerals.

In representing figures for numbers, at least the early man need not have **begun** with just arbitrary symbols. Even those 'arbitrary symbols', if there are any, should have had some rationale behind. With this in mind if we refer to many of the symbols for the figures 1 to 10 in many languages, we are able to see

some reason behind. But numbers 7 and 9 baffle us in many of the inscriptions and in many North Indian languages. Vide. Figs. 5 and 6.

Now a short explanation for the Tamil numerals: (Fig. 1). 'One' has one stroke written with the angular stroke representing perhaps the index finger and a curve for the cursive writing to continue and a cursive finish. Let us remind ourselves that our ancients wrote on palm leaf with the pointed iron. (எழுத்தாணி) Later in the 'caligraphic writing and in' printed form this basic one stroke has become the modern 'ka' (க). Number 'two' (௨) has two strokes basically, the small upper bend may be taken more as a continuation line. 'Three' (௩) has three lines basically; the small curve before the last horizontal stroke is to indicate that this line is just a line of continuation. 'FOUR' (௪) is a square, written with the middle horizonatal line serving as the line of continuation, ending, with an **upward** stroke, perhaps not to be confused with the letter 'su' (சு) in Tamil. 'FIVE' (௫) has a square indicated (for four) and a curved line is added. Why a **curved** line? If a vertical line is to be added to (௪) the question arises 'where to add?' This addition of a vertical line if added-will lead to confusion with other figures, numbers or letters. A little thought would help......'SIX' (௬) has the 'square' four and then two short vertical downward strokes the middle line being, of course, the continuation line (as, again, in ௪).

'SEVEN' is our trump card! Even if 5 in the Arabic numeral is tried to be explained with the five strokes (with the 'belly' standing for an incomplete & suggestive circle standing for four — a square or a

circle may be considered same for this purpose - and the vertical line for the addition of ONE line and the horizonatl line for, perhaps, continuation,) number **7** in the Arabic numeral cannot be explained away **except** in terms of our Tamil seven (எ). Definitely this 7 cannot be just told off as an 'arbitrary symbol'. A look at the confused ways in which number **5** and number **7** have been represented in several of the inscriptions, and writing in Europe at different periods will reveal the real lack of understanding of the evolution of number 7 (Fig. 7 & 8)

'EIGHT' has two circles connected. The way in which **8** is written with the upward stroke in the clockwise way even in the Hindu-Arabic numeral should indicate the 'history' of this figure for eight.

'NINE' is another fine number in Tamil. It is 'One-less Ten' : 'on patu'. It is **not** just another number like one to eight! It has a name with reference to 'TEN' - i.e. one less ten. Ten is a natural unit, standing for the ten fingers. One hand (oru kai) (ஒரு கை) stands for five. Two hands needed to hold (paRRu) (பற்று) stand for ten - (pathu). 'Nine' is not only pronounced as 'onpatu' (ஒன்பது, ஒம்பது) but also represented in writing as 'one less ten'. (The numbers four and nine in Roman numbers though written with reference to five (V) and ten (X), they are **not** named as such). Why? We wonder. Moreover Nine in all INDO ARYAN-EUROPEAN languages is something new. (See list of names of nine attached.) Nine was a discovery to those who knew to count upto only 8! But in Tamil nine, we say what we write; we write what we say! The evolving of the Hindu-Arabic 9 from

the Tamil 9 is more reasonable, and thus explainable, and **not** otherwise. The circle in 9 may stand for four, and that is all; and the one line in addition will make it five and not nine. If that circle is supposed to stand for 'zero'-which, by the way, was **not** discovered by that time, perhaps, - and if that 'zero' is supposed to stand for ten, then the additional number one should be on the other side of the 'ten' to reduce the figure by one, and thus make it stand for 'nine'. And at least one friend of mine who knows some Arabic wrote ten just as we do; wrote **1** first and then the zero even though he wrote all the other numbers from right to left!

In passing we can add that all our Tamil numerals are written clock-wise, except ten (௰). Again obviously, there are grounds to believe that all these ten figures for the ten numerals have had an original origin & these have **not** been 'borrowed' from any other source (extract 6)... An attempt has been made recently by some to suggestively interpret the 'evolution' of Tamil numerals from Brahmi, Saka, Nasik, Gobar and such other inscriptions. But this interpretation is, unfortunately based on false assumptions, the main one being that the ancient Tamils did not have the originality enough for inventing their own scheme of writing their numerals. The chart prepared for the exhibition conducted in connection with the II International Tamil Conference Seminar at Madras contains figures culled from different inscriptions like Nasik, Kalinga, Gupta, Nepal, Vallabhi, Asoka & Saka. Convenient forms have been chosen to 'illustrate' the author's own view. Did not the Tamilians write on palmyrah leaves? Will not inscriptions be less clear and more ill-formed than figures written on palmyrah leaves? Moreover numerals 5, 6, 7, 8, 9 & 10 in those

'early' forms cannot be interpreted and explained how they represent the number they stand for; they are but, perhaps symbols not having any room for any logical interpretation or explanation. If not challenged, these interpretations as suggested in the chart exhibited will stand confirmed as showing the real 'evolution' of the Tamil numerals.

'Ten' in Tamil can be interpreted as having been formed in two ways, just as 'nine' can also be interpreted in two ways, as indicated in Fig. 3 - two lines and two squares, later reduced and 'summarised'. Another, perhaps a better, interpretation will be that the Tamil ten represents two hands placed in the natural way-i.e. side by side, unlike the Roman X which is supposed to stand for two hands placed in an unnatural way. Of course one can see that X was formed of two 'V's in the most convenient way to write the two 'V's together; still for argument sake, at least, a curved 'U' and another 'U' placed side by side will stand for two hands placed side by side, and thereby standing for ten.

The evolving of the two-digit ten (10) from the one-digt ten (௰) in Tamil is a matter of just time, I think. I am not any one in the field of Mathematics! I may be wrong. But when I see very many things being 'invented' brought in somehow to suit their argument, I thought I could also, just for the sake of argument, perhaps, say that the two-digit ten must have been evolved out of the Tamil one-digit ten. Nay, don't we-in our hurry - write 10 as - ௰?

In the early writing of Tamil numerals, though 20, 30, 40 etc. upto 90 were written with 2, or 3 etc. followed by the Tamil ONE-DIGIT ten, does it not indicate a more scientific way of writing at that early time than the way followed by the North Indian groups of languages where they had different figures for 20, 30 etc. upto 90 - unrelated to the units of ten? And, those Tamils who had the systematic way of numbering upto 90, had (and still has) also a word for 90 with reference to 100-i.e. 'thoL + nURu - thoLai patta nURu' (தொள் + நூறு – தொளைபட்ட, குறை பட்ட நூறு) i.e. one 'unit' less, i.e. in this case one ten less - (since so far the numbering has been in tens). And on this same scheme 900 is referred to as one 'unit' (i.e. in this case one hundred) less thousand (thoLLAyiram தொள்ளாயிரம்).

Note the most logical way the Tamilian-nay the Dravidian-named 11, 12, 15 etc. upto 18 with reference to ten; 10 + 1 (பதின் + ஒன்று – பதிெனுன்று) 10 + 2 (பதின் + இரண்டு – பன்னிரண்டு) etc. Compare these with 'GYAARAA', 'BAARAA', THERAA, CHAUDAA etc., of Hindi names of numerals. Moreover one cannot miss to note the lack of scheme in a language which calls 19, 29 etc. with reference to 20, 30 etc. as 'UNNIS' one-less twenty' 'UNNTHIS' 'one - less - 30 etc. that language has a '**new**' (NAU) name for 9. Should they not have had a 'UNDHUS'!? NOTE also the fact that in English (& other European languages) 19 is 9 + 10 (just like 13 to 18) but it is not so in Indo-Aryan languages; it is one less twenty & 29 is one less thirty etc. Does this not reveal yet another fact that the Indo - Aryan learnt something new in India, while the European -

Aryan did not learn that? Under whose influence did this happen? And, when? When 9 was 'new', the Aryans had not learnt what they came to know when they began to count 19! It is for the historians to go deeper! (Vide page 42 Hindu-Arabic Numerals by D. E. Smith & L. C. Karpinsky). The symbol for 100 in Tamil is 'ள'. Perhaps it is a reduced form of ten tens written ௰ (௰) - a clockwise part of ten written the other way round! This is only a conjecture! — a plausible one, perhaps.

Now comes the ZERO itself. As hinted above, the Tamilian was nearer the ZERO and its 'discovery' than anybody else who called 'ZERO' as 'nothing' 'empty'. For the Tamilian 'Zero' is an 'EGG' - 'MUTTAI' (முட்டை). That was how we were taught in our village school. In a town school I was punished for using that word! An egg has an immense value according to the place it finds! 'Muttai stands for one complete 'whole'. The zero is an 'egg' in its shape too! The Tamil 'zero'- 'muttai'-represents the shape as well as its value. Does this not suggest a more intimate relationship indicating the discovery of 'zero'? Moreover the name for nine - 'onpathu'- in Tamil, as already mentioned, means 9 is one less ten'. 'pathu (பத்து > பது) standing for ten, becomes irupathu (20), mupathu (30) etc. In this scheme, 9 is ONE digit - though onpathu is a two-syllable word - but 'irupathu' 'muppathu' etc. upto 80 are TWO-DIGIT figures. Aren't they, according to the wording of these numbers?

"The earliest Arabic Zero known is the dot, used in a manuscript of 873 A. D. (See Extract 1) Some times both the dot and the circle are used in the same work,

having the same meaning, which is the case in an Arabic MSS., an abridged artithmetic of Jamshid 982 A. H. (1575 A.D.)"

Even when a zero was written in the other Indian scripts it was always a **small** circle, and **not** one as big as the other numbers. The Arabs had particular difficulty in taking to a circled zero for a long time because that circle was their 5! Refer Figure 4(a) & 6(0).

But in contrast, the Tamil zero derived from the Tamil ten ம continues to be of the same size as the other numbers.

In form, the Gobar numerals are said to resemble the Hindu-Arbaic numerals much more closely than the Arab numerals do. They varied more or less, but were substantially as shown in Fig. 3.

A comparative study of these forms with those in Figs. 1, 2, 4 and 5 will be fruitful.

Again let us look at the names of the Tamil numbers. We are first struck by the more scientific way of naming, by the uniformity that is followed, unlike in other languages where there are unconnected names for all the numbers from one to ten. We have : onRu (oNNU); irandu (rendu), mUnRu, (mUNu); nAngu, (nAlu); ainthu, (anju); ARu, (ARu); EZu, (EZu); ettu (ettu); onpathu, (ombathu); pathu, (pathu) ....all ending in the same way. That shows a more planned naming scheme than what can be found in a haphazard way in other languages, including the

Sanskrit or the Hindi or any other Indian languages-(except, of course, the other South Indian languages).

I have some firm grounds, I feel, about the ideas expressed above about the formation of Tamil numbers, and the interpretations given regarding the form of these numbers. Especially regarding numbers 5, 7 and 9 and 10 the interpretations given will go a long way to make one think seriously whether there had not been any connection between these numbers and the Hindu-Arabic numerals. (Extracts 3, 4 & 5). Even if this theory is not acceptable, the least the Tamilians can do will be to take some steps to keep these Tamil figures in use at least in some ways, and preserve for the future generation.

I have **not** yet come across any reasonable interpretation of Tamil numbers with due credit given to the genius of Tamilians. If our own people forget the use of these numbers at least in some form or in some places, how can we complain about others not paying their respects to the Tamil genius that invented these figures?

EXTRACTS

1. **HINDU ARABIC NUMERALS** by D. E. Smith & L. C. Karpinsky.

   P. 54 : "The small circle (for Zero) was possibly suggested by the spurred circle which was used for ten". In a foot-note under this the authors ask: "Does the fact that the early European arithmetics, following the Arab custom, always put the O after the 9 suggest that O was derived from the old Hindu symbol for ten?"........ What a meaningful and suggestive question!

2. ibid P. 42: "......the reading of numbers of this kind shows that the notation adapted by the Hindus tended to bring out the place idea. No other language than Sanskrit has made such consistent application, in numerations of the decimal system of numbers. The introduction of myriads as in Greek, and thousands as in Arabic and in modern numeration, is really a step away from a decimal scheme. So in the numbers below one hundred, in English, eleven and twelve are out of harmony with the rest of the teens, while the naming of all the numbers between ten and twenty is not analogous to the naming of the numbers above twenty. To conform to our written system we should have ten-one, ten-two, ten-three, and so on, as we have twenty-one, twenty-two and the like. The Sanskrit is consistent."

   The reader has to compare this statement with the names of these numerals in Tamil. The consistency is noted only in Tamil and **not** in Sanskrit and definitely **not** at all in Hindi etc.

3. ibid P. 96: The particular paths of conquest & of commerce were by way of the Khyber Pass and through Kabul, Herat and Khorassan or by sea through the straight of Ormuz to Basra (BUSRA) at the head of the Persian Gulf, and thence to Bagdad. As a matter of fact one form of Arabic

numerals, the one now in use by the Arabs is attributed to the influence of Kabul, while the other **which eventually became our numerals may very likely have reached Arabia by the other route.** It is in Bagdad, that our special interest in the introduction of the numerals centres.

4. ibid P. 82. Long before the war-like activity of the Arabs, Alexandra had become the great market-place of the world. From this centre caravans traveresed Arabia to Hadramaut, where they met ships from India.

ibid. P. 78 : The products of the East were always finding their way to the East, the Greeks getting their ginger from Malabar.

5. THE WRITING OF THE ARABIC NUMERALS by G. G. Neill Wright

P. 105: The period 800-600 B. C. in India was marked by great advances in industry and commerce, including maritime trade between South-West Indian ports and Babylon. Such contacts with that mercantile centre would be favourable to the introduction of writing, especially the use of numerals".

6. ibid P. 52 : "From the period mentioned (9th c.) the spread of numerals was rapid over all of India, save the southern part where the Tamil and Malayalam people retain the old system even to the present day". (What a fate, the Tamil numerals escaped the attention of these scholars!)

Fig. 2-A

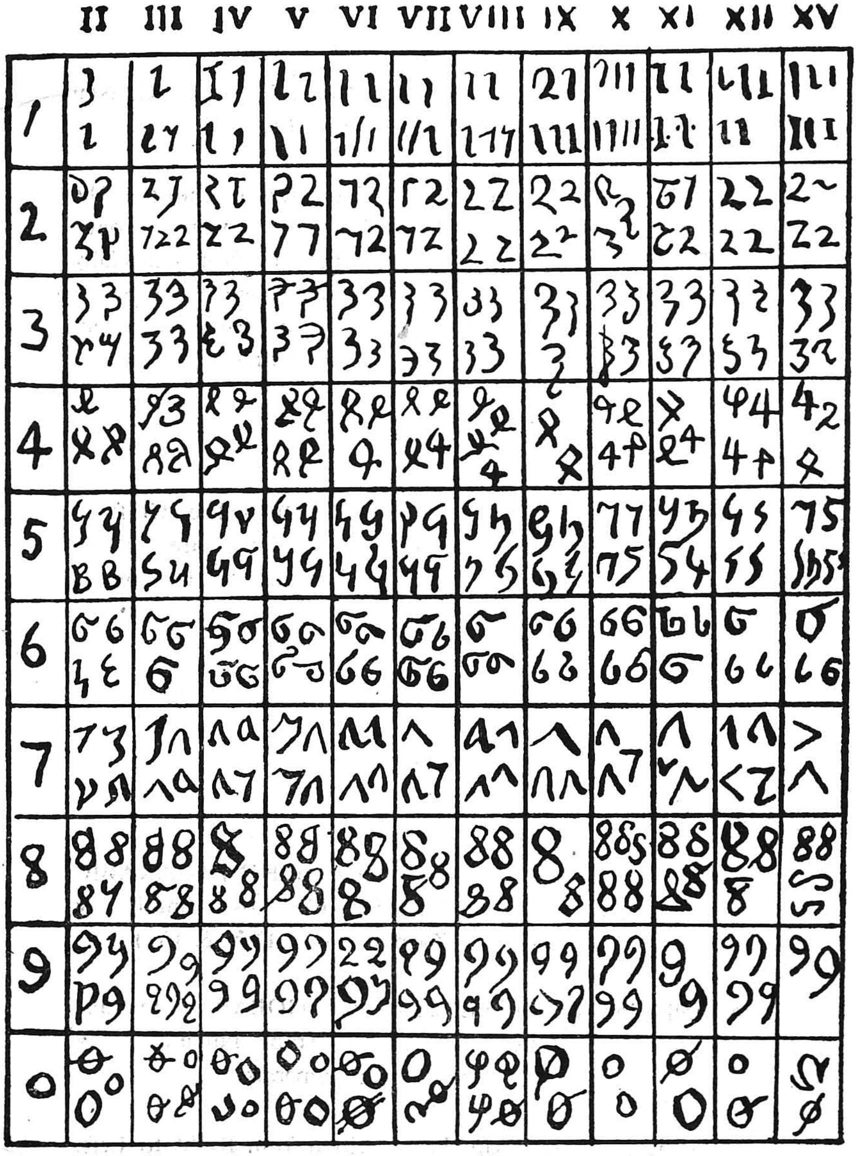

Fig. 2-B

Fig. 2A (p. 132 of ARABIC NUMERALS by G. G. Neil Wright — University of London Press Ltd.)

The Development of the Arabic Numerals in Europe. The figure presents the numerals from 1 to 10 as were in vogue in Europe during the mediaeval period. Note especially the shapes of 7 where we can recognize the Tamil Seven (எ). The numerals 9 and 10 are to be carefully noted. The variations of 4 & 5 are also interesting.

Fig. 2B (ibid p. 133)

From the first page of mss. (C-1300) — 'The Craft of Numbering' — The numerals in this figure are 'Indian numerals'. Note the shapes of 4, 7, 9 and 0. The mss. is in the British Museum.

Fig. 3 (p. 69 of HINDU ARABIC NUMERALS by Smith & Karpinsky — GINN & Co.)

A collection of various shapes of GOBAR Numerals. According to Western scholars the Arabic numerals may have had their origin from Gobar numerals.

Note the numbers having been written from Right to Left. Note also the difficulties experienced in writing 7 and 8. All the figures for '9' have rounded lines and not vertical lines. The third line represents the Arabic numerals in 970 A. D.

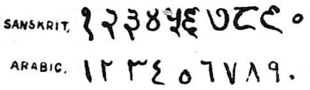

Fig. 4A (p. 48 ibid)

This figure shows the Sanskrit and the Arabic numerals. Note the small o for zero in Sanskrit and a dot for the same in Arabic. Note also the Arabic 5 which is a small circle.

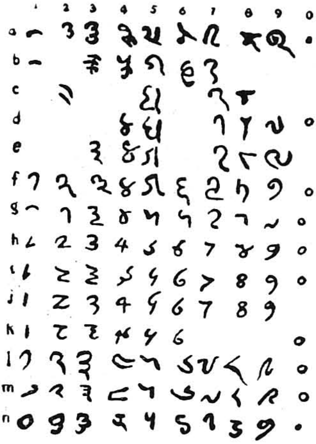

Fig. 4B (p. 49 ibid)

'Hindu' numerals — Note the shapes in the various lines from a to n:

a) Baksali (Note 1, 4, 7, 8 and 9)

b) Daulatabad Plates 595 A.D. (Note 4 and 7)

c) Plates c 804, 815 (Note 5, 7 and 8)

d) 917 A D. (Note 4, 5 & 7)

e) Copper Plate c 972 (Note 3, 4, 5, 7 & 8)

f) Copper Plate c 1050 (Note 1, 2, 3, 4, 5, 7 & 9)

g) 11th century — Telugu and Kannada numerals. (Note 3, 4, 5, 7 and 8)

h & i) From a mss. of later part of 13th century. (Note 1, 5, 8 and 9)

j & k) Mss. of 14th century (In K note 3, 4 & 5 and in J note 4, 5 and 9)

l) Mss. from Tibet (Note 1, 3, 4, 7 & 8)

m) In Print from Tibet (Note 1, 2, 3, 4, 7 & 8)

n) Sarada numerals in Atharva Veda of Kashmir. (Note 3, 4, 5, 6, 7, 8 and 9)

In all these the zero is either a dot or a small circle.

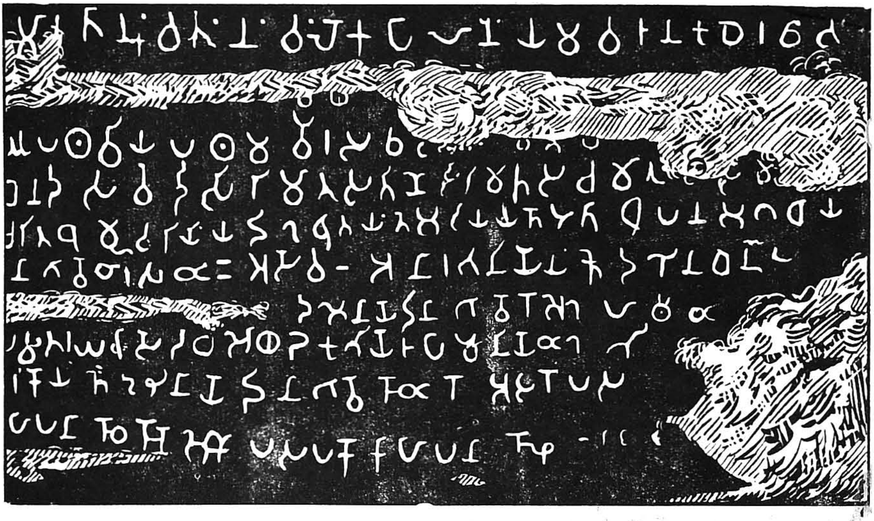

Fig. 5A (p. 24 ibid)

The numerals found in the Nasik cave inscriptions. Note the horizontal shapes of 1, 2 & 3, and note the two forms of 4, 5 and 10. In these inscriptions there are different figures for 100, 1000 etc.

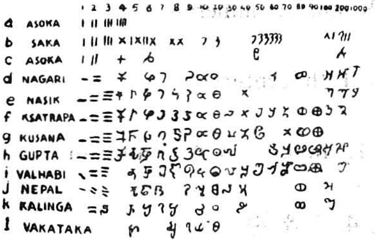

Fig. 5B (p. 25 ibid)

The Process of Numeral Forms in India

Line 1. From Asoka's inscriptions 250 B. C.

2. From inscriptions 100 B. C.

3. Brahmi numerals 250 B. C.

4. Nana Ghat inscriptions 150 B.C.

5. Nasic inscription 100 B. C. (Fig. 5A)

6. Ksatrapa coins 200 A. D.

7. Kusana inscriptions 150 A. D.

8. Gupta ,, 300 A. D.

9. Vallabhi inscriptions 600 A. D.

10. Numerals from Nepal.

11. ,, ,, Kalinga.

12. ,, ,, Vakataka.

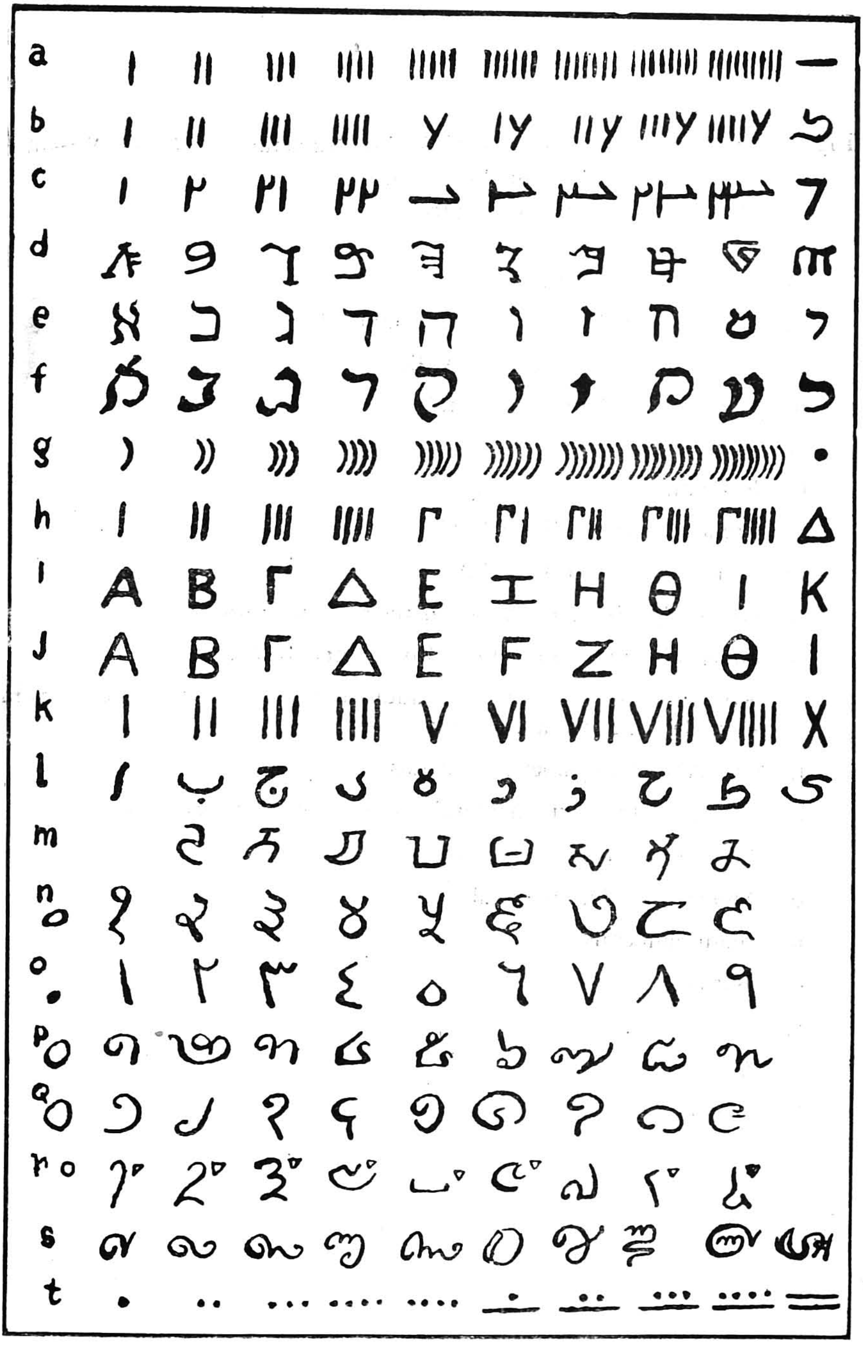
a
b
c
d
e
f
g
h
i A B Γ Δ E I H Θ I K
j A B Γ Δ E F Z H Θ I
k I II III IIII V VI VII VIIII VIIII X
l
m
n
o
p
q
r
s
t

Fig. 6

Fig. 6 (p. 118 : The Writings of Arabic Numerals by G. G. Wright - University of London Press Ltd.)
Numerals of various countries.

a) Phoenesian numerals

b) Syrian (in Palmyrah) 1—3rd century A. D.

c) „ — 6—7th century A. D.

d) Samaritan alphabetic numerals.

e) Hebrew „ „

f) Rabbinnic „ „

g) Cretan numerals (1500 B. C.)

h) Attic numerals (600 B. C.)

i) Greek alphabetic numerals in their earlier form.

j) Greek alphabetic numerals (3rd century B. C.)

k) Roman numerals using the additive principle. The later substractive IV and IX are familiar.

l) Old Arabic alphabetic numerals.

m) Sanskrit alphabetic numerals of the 2nd century A. D.

n) Modern Sankcrit numerals

o) Modern Arabic numerals

p) Siam numerals

q) Burmese „

r) Tibet „

s) Ceylon „

t) Maya „

Fig. 7 (p. 127 ibid)

The numerals in the first line of the figure, written in Spain in A. D. 976 are the earliest in a European manuscript. The next two lines show the forms of the numerals in the 10th and 11th centuries while the figures in the other lines belong to 12th, 15th and 16th centuries. Note the forms of 2, 3, 4, 5, 6, 7, 8 and 0 and compare them with the Tamil numerals.

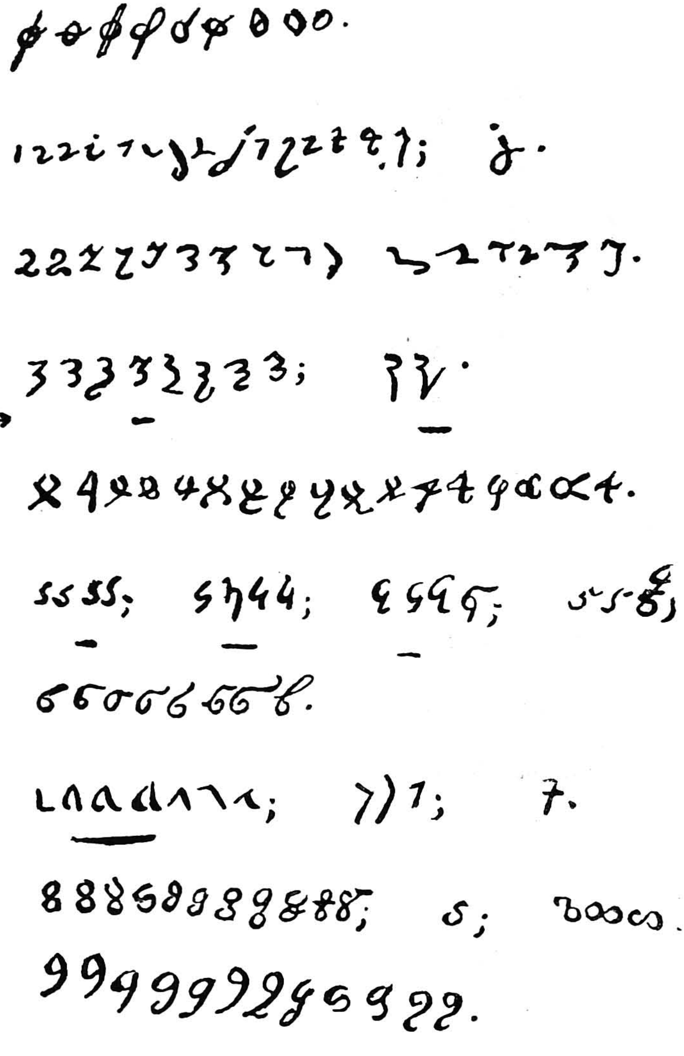

Fig. 8 (p. 141 ibid)

Renaissance figures of the numerals.
Compare the figures 0, 3, 4, 5, 6, 7, 8 & 9 with Tamil numera.